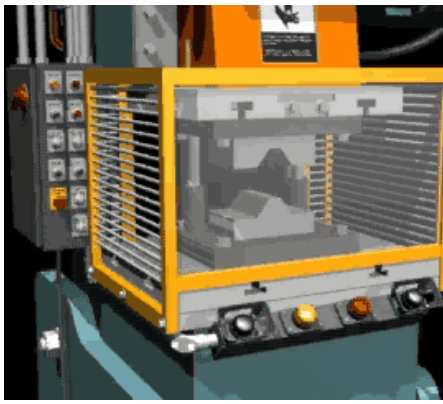
Stamping (metalworking)

Stamping (also known as **pressing**) is the process of placing flat sheet metal in either blank or coil form into a stamping press where a tool and die surface forms the metal into a net shape. Stamping includes a variety of sheet-metal forming manufacturing processes, such as punching using a machine press or stamping press, blanking, embossing, bending, flanging, and coining.[1] This could be a single stage operation where every stroke of the press produces the desired form on the sheet metal part, or could occur through a series of stages. The process is usually carried out on sheet metal, but can also be used on other materials, such as polystyrene. Progressive dies are commonly feed from a coil of steel, coil reel for unwinding of coil to a straightener to level the coil and then into a feeder which advances the material into the press and die at a predetermined feed length. Depending on part complexity, the number of stations in the die can be determined.



Power press with a fixed barrier guard

Stamping is usually done on cold metal sheet. See Forging for hot metal forming operations.

Contents

History

Stamped parts were used for mass-produced bicycles in the 1880s. Stamping replaced die forging and machi resulting in greatly reduced cost. Although not as strong as die forged parts, they were of good enough quality.[2]

Stamped bicycle parts were being imported into the United States from Germany in 1890. U.S. companies then star have stamping machines custom built by U.S. machine tool makers. Through research and development Western W was able to stamp most bicycle parts.[3]

Several automobile manufacturers adopted stamped parts before Ford Motor Company. Henry Ford resiste recommendations of his engineers to use stamped parts, but when the company could not satisfy the demand wi forged parts, Ford was forced to use stampings.[4]

Over the history of metal stamping, forging and deep drawing, presses of all types are the backbone of m manufacturing. The processes continue to evolve and improve in moving more metal in one stroke of a metal sta press. Press and interconnected automation devices increase production rates, reduce labor costs and provide h safety levels for factory workers. In today's metal stamping environment, controls such as I-PRESS with Conn Enterprise are able to capture history, send reports or the I-PRESS & Automation control can be viewed from rem mobile devices. A new trend in gathering information on today's production for historical data.

Operations

I-PRESS & Automation Control to capture historical data for metal stamping processes

- Bending - the material is deformed or bent along a straight line.
- Flanging - the material is bent along a curved line.
- Embossing - the material is stretched into a shallow depression. Used primarily for adding decorative patterns. See also Repoussé and chasing.
- Blanking - a piece is cut out of a sheet of the material, usually to make a blank for further processing.
- Coining - a pattern is compressed or squeezed into the material. Traditionally used to make coins.
- Drawing - the surface area of a blank is stretched into an alternate shape via controlled material flow. See also deep drawing.
- Stretching - the surface area of a blank is increased by tension, with no inward movement of the blank edge. Often used to make smooth auto body parts.
- Ironing - the material is squeezed and reduced in thickness along a vertical wall. Used for beverage cans and ammunition cartridge cases.
- Reducing/Necking - used to gradually reduce the diameter of the open end of a vessel or tube.
- Curling - deforming material into a tubular profile. Door hinges are a common example.
- Hemming - folding an edge over onto itself to add thickness. The edges of automobile doors are usually hemme

Piercing and cutting can also be performed in stamping presses. Progressive stamping is a combination of the methods done with a set of dies in a row through which a strip of the material passes one step at a time.

Stamping lubricant

The tribology process generates friction which requires the use of a lubricant to protect the tool and die surface scratching or galling. The lubricant also protects the sheet metal and finished part from the same surface abrasion a as facilitate elastic material flow preventing rips, tears or wrinkles. There are a variety of lubricants available for this They include plant and mineral oil based, animal fat or lard based, graphite based, soap and acrylic based dry films newest technology in the industry is polymer based synthetic lubricants also known as oil-free lubricants or n lubricants. The term "Water-Based" lubricant refers to the larger category that also includes more traditional oil a based compounds.

Simulation

Sheet metal forming simulation is a technology that calculates the process of sheet metal stamping,[6] predicting con defects such as splits, wrinkles, springback and material thinning. Also known as forming simulation, the technolog specific application of non-linear finite element analysis. The technology has many benefits in the manufact industry, especially the automotive industry, where lead time to market, cost and lean manufacturing are critical t success of a company.

Recent research by the Aberdeen research company (October 2006) found that the most effective manufacturers s more time simulating upfront and reap the rewards towards the end of their projects.[7]

Stamping simulation is used when a sheet metal part designer or toolmaker desires to assess the likelihood of succes manufacturing a sheet metal part, without the expense of making a physical tool. Stamping simulation allows any metal part forming process to be simulated in the virtual environment of a PC for a fraction of the expense of a ph tryout.

Results from a stamping simulation allow sheet metal part designers to assess alternative designs very quickly to opt their part for low cost manufacture.

Microstamping

While the concept of stamping sheet metal components has traditionally focused on the macro level (e.g. vehicle, air and packaging applications), the continuing trend of miniaturization has driven research into micro- forms of stam From the early development of micropunching machines in the early to mid-2000s to the creation and testing microbending machine at Northwestern University in the 2010s, microstamping tools continue to be research alternatives to machining and chemical etching. Examples of applications of sheet metal microstamping include elec connectors, micromeshes, microswitches, microcups for electron guns, wristwatch components, handheld c components, and medical devices. However, key issues such as quality control, high-volume application, and the nee material research into mechanical properties must be addressed before full-scale implementation of the technolo realized.[8][9][10]

Industry-specific applications

Metal stamping can be applied to a variety of materials based on their unique metalworking qualities for a numb applications across a wide range of industries. Metal Stamping may require the forming and processing of base con metals to rare alloys for their application specific advantages. Some industries require the electrical or the conductivity of beryllium copper in areas such as aerospace, electrical, and the defense industry or the high str application of steel and its many alloys for the automotive industry. Industries metal stamping is used for:

- Aerospace
- Agriculture
- Ammunitions
- Major appliances
- Small appliances
- Automotive
- Commercial
- Construction

- HVAC
- Lawn Care & Equipment
- Lighting
- Lock Hardware
- Marine
- Medical
- Plumbing
- Power Storage
- Power Tools
- Small Engine

See also

- Circle grid analysis
- Forming limit diagram
- Four-slide machine, a combination stamping, bending, and punching machine
- Progressive stamping
- Shearing (manufacturing)
- Punching

Footnotes

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